



ENGINEERING MAINTENANCE BRANCH BULLETIN

Issue # 007

November 2005

THIS MONTH'S BULLETIN CONTAINS:

- *Picture of the Month*
- *SAMM/Maintenance Tips*
- *Implementing Insulation Resistance Monitors*
- *Question of the Month –Percentage of electrical shipboard maintenance?*
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- *C'mon Let Us Hear Ya! Send Your Feedback!*
- *The Benefits of Triaxial Data*

This is the monthly bulletin to MSC ships and shoreside personnel. The purpose of the bulletin is to inform all concerned of current COMSC Preventive Maintenance management practices associated with any new or revised policy and procedures, along with helpful tips & tricks for improved maintenance. The bulletin will also discuss and present any upcoming initiatives in the various programs.

We continue our efforts to bring you useful information with the page dedicated to the Vibration Monitoring System (VMS). This will have useful tips as well as past case histories.

PICTURE OF THE MONTH - WE NEED YOUR PICTURES!!

It is said, "A picture's worth a thousand words!" Let's prove it right. If you have pictures of Shipboard Maintenance (Vibration Monitoring, Oil Sampling, machinery upkeep, etc.) being performed, or a visit from a SAMM or VMS Tech Rep, please send them (along with a *brief* narrative as to what the picture is) to Norm Wolf (e-mail: Norman.wolf@navy.mil).



Shown above is a Supply Pump motor controller on an MSC vessel. An insulation resistance monitor was installed in the cabinet very close to the 440V supply lines for the motor starter. Since the controller must be energized in order to test the insulation resistance monitor, personnel must very careful when pressing the TEST button to not accidentally touch a live component. See Page 2 for more about it!

SAMM/Maintenance Tips

Running Hours: Running hours are critical for the scheduling of running hour-based maintenance. Before the schedule is run ensure that all the correct hours are input into the Utilities/Run Hours module. If parent equipment shows up in the Run Hours module (indicated by a yellow folder) all the child equipment in that folder will have its running hours incremented by the same increment as the parent equipment, or you can update the child equipment by alone by opening the parent equipment folder.

-Tip provided by Seaworthy Systems Inc.

Fastener care: To avoid abrasion and corrosion wear to the Allen head bolts (specifically material handling fans) add a small amount of silicone to the bolt head. When it's time to remove the Allen bolt dig out the silicone. The bolt will look like new.

-Tip provided by Don Carmen, Vibration Tech
Weyerhaeuser M.D.F, Eugene OR USA



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Implementing Insulation Resistance Monitors

(By David Greer, Electrical Engineer)

Operating vessels in the marine environment is extremely tough on electrical equipment and systems. When you combine the high humidity, salinity, corrosive chemicals and fumes, temperature and high UV exposure, the working conditions for these systems are very demanding. So demanding that measures are employed to guarantee the reliability of these electrical systems.

One of the methods in which this is currently handled is insulation resistance monitoring. As Charles I. Hubert states in his book, *Preventive Maintenance of Electrical Equipment*, "Insulation resistance is affected by moisture and dirt and is therefore a good indicator of deterioration from such causes." **Fact: Motor/Generator insulation resistance is always deteriorating.** Feeder cables develop cracks due to UV exposure and motor insulation develops cracks with long machinery idle time. When the motor is idle, moisture accumulates, lowering insulation resistance – causing burnout on starting. According to a 2002 IEEE (Institute of Electrical and Electronic Engineers) survey, approximately 30% of motors failures are insulation related.

Insulation resistance monitoring may be performed on motors in any area of the vessel where electrical machinery may sit idle but must be effective on demand, e.g. the lower platform, deck machinery, standby generators. It can detect a wet motor while they are idle – most grounds occur when wet motors are started. From this point, preventive maintenance can be scheduled when convenient, thus eliminating failure and the need for an emergency replacement or rewind. Meggering and *constant* insulation resistance monitoring devices (i.e. we use *Failsafe* from MSE of Canada, Ltd.) are the two methods in which we monitor motor insulation resistance.



Figure 1. Failsafe device.

For all critical motors (mostly those rated at greater than 25HP), we have recommended to the Program Managers that they use *Failsafe* devices to provide *constant* insulation resistance monitoring in lieu of meggering. The reason for this is constant insulation resistance monitoring devices provide a number of benefits over meggering.

Benefits of Insulation Resistance Monitors

Where Meggering quarterly will only tell you the insulation resistance at four instantaneous times, *Failsafes* give real-time status of motors' insulation resistance thus giving early warning of insulation problems before motors (or generators) with deteriorated insulation are in immediate danger of failing on start up. Additionally, the devices automatically disconnect when the motor is energized.

Another feature of *Failsafe* devices is their self-test capability. This is the feature that we will be taking advantage of in our megger replacement maintenance in SAMM. Instead of an electrician/engineer having to megger and record the readings, they will instead press and hold the TEST button until the indicator light acknowledges the device's proper or improper operability and document performance of this test.

This change will reduce meggering related man-hours for electricians/engineers responsible for electrical maintenance and they can redirect their time to accomplishing other tasks. It should take no longer than a minute to open the controller cabinet and test the insulation-monitoring device as opposed to the prep work and time required for meggering.

To maximize personnel safety, *Failsafe* devices have been designed to use low DC voltage to sense insulation resistance instead of the 500 volts and up required by meggering instruments.

How does this affect SAMM maintenance?

The SAMM (Shipboard Automated Maintenance Management) system will reflect this change by removing the megger maintenance requirement of motors with *Failsafe* devices installed. Instead, these motors will have their megger action reassigned to Y99 status a.k.a. "as necessary" frequency and will have a new maintenance action that describes the insulation resistance monitor testing procedure. This allows any Chief Engineers who would still prefer to megger the motors with insulation resistance monitors to do so and record the results in SAMM.

Installation of Resistance Monitors

Caution: Due to the spatial arrangement of some of the controller cabinets, testing the devices needs to be done cautiously.

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Question of the Month: What percentage of shipboard maintenance is Electrical?

(By David Greer, Electrical Engineer)

A survey was performed on the USNS Supply (T-AOE 6) in 2002 that found that out of 2,040 pieces of equipment in SAMM, 720 were electrical equipment. Consequently, roughly 35% of all equipment tracked in SAMM is electrical equipment.

Additionally, out of a total of 9,079 jobs/year in SAMM, 2,591 jobs were electrical. And out of those 2591 electrical jobs, Meggering represented over 1,000 jobs.

Hence, roughly 29% of all jobs in SAMM are electrical related. Moreover, Meggering accounts for around 39% of the electrical jobs performed in SAMM. So, if we can replace some of the Meggering jobs with insulation resistance monitoring devices, then we can reduce a significant portion of the electrician's workload.

NOTE: Keep in mind that this data was taken for a T-AOE vessel and the results will vary slightly with between various classes of MSC ships, based on configuration and mission requirements.

For more information, or if you have any questions/comments, contact David Greer (david.greer1@navy.mil).

Engineering Maintenance Branch Website – something old is new again!!

The Engineering Maintenance Branch web page has had a bit of a facelift; along with some helpful downloads (SAMM, PENG, EASy overviews, OAS Guide, past issues of our bulletin, etc.), the latest CMEO Class information and who to contact for questions or comments regarding Engineering. Maintenance. For helpful updates, keep checking it out!

<http://www.msc.navy.mil/n7/engmgmt/engmgmt.htm>

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Each vessel will be provided with a 100KΩ test resistor along with instructions to de-energize the cabinet, where to attach the test resistor, to close and energize the cabinet, and observe the TEST indicator light to see if the monitor is operating properly. This is the safest possible method of testing the insulation resistance monitors and we recommend that everyone use this simple method for testing the Failsafes. The frequency at which the insulation monitors are tested has not been decided yet but rest assured that our goal is to reduce the work for the shipboard engineers while upholding the fleet's electric motor reliability.

We currently have updated insulation resistance monitors on most of our GOCO vessels in PM2, PM3, and PM5 and are working to issue the devices out to our GOGO vessels in PM1. Our objective is to have all MSC vessels install the insulation resistance monitors on their appropriate motors in order to save onboard personnel time and to assist them in reliably monitoring the quality of their machinery.

How does ABS feel about Insulation Resistance Monitoring?

In May 2005, ABS released the following statement in a letter, which will be distributed to all MSC ships:

"We...are pleased to confirm that ABS would be agreeable to accepting the insulation resistance monitors in lieu of manually Meggering on MSC vessels." ABS stipulates, however, that:

1. The attending Surveyor may require random confirmations of the alarm set points during surveys.
2. Any suspect equipment from the Surveyor's visual examination or based upon records onboard may be required to manually meggered.
3. Each vessel must maintain a log of the monitor's alarm history as well as the corrective action taken which the surveyors should review during applicable surveys.



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N711 – Points of Contact:

Branch Chief – Randy Torfin, (202) 685-5744
(Randel.Torfin@navy.mil);

Sr. Mechanical Engineers – Will Carroll, (202) 685-5742 (William.S.Carroll@navy.mil) & Norm Wolf, (202) 685-5778 (norman.wolf@navy.mil);

Mechanical Engineers – Liem Nguyen, (202) 685-5969 (liem.nguyen@navy.mil) & Andrew Shaw, (202) 685-5721 (andrew.shaw@navy.mil);

Electrical Engineer – David Greer (202) 685-5738
(David.Greer1@navy.mil)

CMEO Training – What Are YOU Waiting For????

CMEO (Civilian Marine Engineering Officer) is a two-week training course (held *quarterly*) at the Naval Supply Corps School in Athens, GA. It is for both shipboard and shoreside engineers. The Engineering Directorate (Code N7) of Military Sealift Command hosts the course and encourages **ALL** MSC Engineers (3rd A/E's through Chief Engineers, as well as Port Engineers and Project Engineers) to attend (***Note:** MSC shipboard engineers are given priority when classes are full*).

CMEO provides training on an array of topics such as: SAMM (MALIN, Logbook, etc.), Vibration Monitoring, Lube Oil, Fuel Oil (NEURS), Chemicals (boiler treatment, sewage treatment, etc.), Supply (COSAL, ShipCLIP), Environmental, and Safety. SAMM is interactively taught using actual data and each module is discussed extensively.

Upcoming CY '05 class dates:

- December 05-16, 2005 **← FILLING FAST - SIGN UP TODAY!!**

Upcoming CY '06 class dates:

- Jan 23-Feb 3, 2006
- April 17-28, 2006
- July 10-21, 2006
- December 04-15, 2006

For further information and to sign up, please go to the CMEO website:

<http://63.219.124.12/cmeoclasssignup/cmeo.htm>

Or contact Dave Greer (david.greer1@navy.mil) with any questions.



C'mon Let Us Hear Ya! Send your Feedback!

We've had more and more requests for the newsletters, from both shoreside AND shipboard engineers, so we know you're reading them. Now, tell us what you think! Feedback is *ESSENTIAL* to making this a helpful bulletin to all shipboard personnel in doing your job "smarter not harder". Please pass on any and all feedback from your Engine Department.

Not just Junk mail

JUNK MAIL: You don't want it; we don't want to create it. Make this **YOUR** Maintenance Management Bulletin. If there's a SAMM or Maintenance tip, topic, question, suggestion, or comment on how to make this useful, or something relating to Engineering Maintenance you think should get out to the ships, please pass it on. Send your submission to Randy Torfin (randel.torfin@navy.mil) **OR** Norm Wolf (norman.wolf@navy.mil).

COMING UP FOR NEXT MONTH!

New SAMM/Maintenance Tips!

Proactive Maintenance

Another Question of the Month

New Pictures of the Month!

**Vibration Monitoring Tips &
Information**



ENGINEERING MAINTENANCE BRANCH BULLETIN

The Benefits of Triaxial Data

By Mike Johnson, Senior Vibration Engineer
DLI Engineering (www.DLIengineering.com)

Let's presume for example, that bearing cap vibration measurements in a motor driven pump show low radial, moderate axial, and strong tangential levels. It's easy to fix this alignment problem once identified, right? But let's say that during the analysis, only a single radial reading is taken. By itself, this low reading would indicate a problem-free machine. The undetected misalignment could lead to abnormally high wear and, eventually breakdown. On the other hand, perhaps only a tangential reading is taken. This would indicate an imbalance and lead to expensive, time consuming, or unnecessary repair. The only way to reach an accurate diagnosis is by analysis of data from all three axes: axial, radial, and tangential.

These three axes fully describe all possible vibration linear motion. Axial vibration is in line, or parallel to the centerline of a shaft.

Radial and tangential vibrations are perpendicular to the shaft. Because there are three distinct planes of motion, the absence of one signal is just as important as strong vibration from another.

The results of a survey conducted on a USN Aircraft Carrier support these conclusions. Analyzing vibration data from all three axes of the 262 machines tested resulted in 97 repair recommendations. However when the analysis was repeated with the vibration information from only one axis, the number of repair recommendations dropped to 45. There were no miraculous cures of course; the reduction was due to undetected faults!

Data collection from all three axes can be done simultaneously. It is critical that the test conditions meet the requirements of the Vibration Test and Analysis Guide (VTAG). Only then will the triaxial pickup accurately and efficiently do the job.

